MATH 622 - Mathematical Finance II
W 6:40 PM - 9:30 PM, Room: PH-111

Instructor: Triet Pham, Office: Hill Center Room 207, Email: triet.pham@rutgers.edu

Office Hours: WTh 4:00 - 5:00 pm, M 2:00 - 4:00 pm and by appointment.

Textbook: Shreve, *Stochastic Calculus for Finance II: Continuous-Time Models*.
Reference: Karatzas and Shreve, *Brownian motion and Stochastic Calculus*.

Course TA: Vladimir Lubyshev, Office: Hill 603, Email: v.lubyshev@gmail.com.
Office Hours: F 3-6:00 pm.

Course Objectives: This course continues the development of the mathematical theory of derivative security pricing begun in Mathematics Finance I and, in addition, focuses on applications to financial models. Topics covered include exotic options (such as barrier, lookback, and Asian options), stopping times, American-style (early exercise) options, McKean's formula for the perpetual American put, change of numraire and risk-neutral measure, interest rate models, bonds and options on bonds, term-structure models (Heath-Jarrow-Morton model, forward LIBOR model, swap market model), Black's formulae for caps and swaptions. The course ends with an introduction to jump models, including compound Poisson, jump diffusion, and Lvy processes, stochastic calculus and change of measure for jump processes, and option pricing with jump processes.

Course Outline:

This is a tentative outline. As the course progesses, we may adjust the pace and / or the material if necessary.

WEEK 1-3: Models with jumps and stochastic calculus for jump processes. Text: Shreve, Chapter 11. Week 1: 11.1-11.5, Week 2: 11.5-11.7, Week 3: 11.7.

WEEK 3-7: Stopping times; running maxima of Brownian motion; pde's and explicit formulae for barrier, look-back, and Asian options. Text: Shreve, Chapter 7. Week 3: 3.6,3.6, 8.2, Week 4:7.1,7.2, Week 5: 7.3,7.4, Week 6: 7.4, 7.5, Week 7: 7.5.

WEEK 7-9: Optimal stopping and the American Option. Text: Shreve, Chapter 8. Week 7: 8.3, Week 8: 8.3,8.4, Week 9: 8.5.

WEEK 9-10: Change of Numeraire and Its Applications. Forward prices, random interest rates. Text: Shreve, Chapter 9. Week 9: 9.1,9.2,9.3. Week 10: 9.3, 9.4.

WEEK 11-14: Term-Structure Models for Interest Rates; Affine yield and HJM Models, Forward LIBOR and pricing caplets. Text: Shreve, Chapter 10. Week 11: 10.1,10.2, Week 12: 10.2, 10.3, Week 13: 10.2, 10.3, Week 14: 10.3, 10.4.

Grade Breakdown:

Homework: 10 %; Midterm 1: 25 %; Midterm 2: 25 %; Final: 40 %

Academic Honesty: As a Rutgers University student, you have agreed to abide by the Universitys academic honesty policy, as stated in http://academicintegrity.rutgers.edu. Lack of knowledge of the academic honesty policy is not a reasonable explanation for a violation. Questions related to course assignments and the academic honesty policy should be directed to the instructor.

University Attendance Policy: Students are expected to attend classes regularly, according to what is stated in http://sasundergrad.rutgers.edu/academics/courses/registration-and-course-policies/attendance-and-cancellation-of-class

Important Dates:

First midterm . . . . .March 4, 2015
(Subject to change, to be taken before the warning grade dealine)
Second midterm . . . . .April 8, 2015
Final Exam . . . . .May 12, 2015 4-7 pm SEC 209